REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 15, 18, 19, and 25-27 are pending in the present application, Claims 15, 18, and 19 having been amended, Claims 25-27 having been added, and Claims 1-14, 16, 17, and 20-24 having been canceled without prejudice or disclaimer. Support for the present amendment is believed to be self-evident from the originally filed specification.[1] Applicants respectfully submit that no new matter is added.

In the outstanding Office Action, Claims 1-12 were rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Sugo et al. (U.S. Patent No. 5,308,467, hereinafter Sugo); and Claims 13-24 were rejected under 35 U.S.C. §103(a) as unpatentable over Sugo in view of Akahori et al. (U.S. Patent No. 6,423,205, hereinafter Akahori).

Applicants respectfully submit that the rejection of Claims 1-14 and 21-24 is moot in view of their cancellation.

With respect to the rejection of Claim 15 as unpatentable over Sugo and Akahori, Applicant respectfully submits that the amendment to Claim 15 overcomes this ground of rejection. Amended Claim 15 recites, *inter alia*,

> wherein, in a deionization compartment, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are alternately laminated on one another in a direction intersecting a water-passing direction from a water inlet to a treated water outlet of the deionization compartments such that opposite ends of each of the sheets of the anion exchange fibrous material and the sheets of the cation exchange fibrous material come into contact with both of an anion exchange membrane and a cation exchange membrane demarcating the deionization compartment, and

[1] See, for example, Figs. 2, 6, 10, 11, 14, and 15, and original Claims 16, 17, and 20.

> at least one of the sheets of anion exchange fibrous material and the sheets of cation exchange fibrous material is a material obtained by introducing an ion exchange group onto a substrate using radiation-induced graft polymerization.

Sugo and Akahori, taken alone or in proper combination, do not disclose or suggest at least these elements of amended Claim 15.

Claim 15 describes a laminated ion exchange structure that has one or more sheets of anion exchange fibrous material and one or more sheets of a cation exchange fibrous material, which are alternately laminated. The structure is packed within a deionization compartment. Non-limiting examples of this structure are shown in Applicants' Figs. 2, 6, 10, 11, 14, and 15. These figures show that the surface of the laminated ion exchange structure intersects a water-passing direction from a water inlet to a treated water outlet of the deionization compartment, which is shown in the figures by an arrow of "RO TREATED WATER."

Sugo describes an electrically regenerable demineralization apparatus including non-woven fabric 3 which is formed of cation- and anion-exchange fibers, an anion-exchange membrane 4, a cation-exchange membrane 5, a demineralizing compartment 6 in which the fabric 3 is loaded, a concentrating compartment 7, a spacer 8, a gasket 9, a clamping frame 10, and a liquid supply frame 11.[2] Sugo uses one sheet of the non-woven fabric in the demineralizing compartment. Sugo does not disclose or suggest a plurality of laminated sheets of the anion exchange fibrous material and the cation exchange fibrous material in the deionization compartment.

Thus, Sugo does not disclose or suggest the claimed "in a deionization compartment, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are alternately laminated on one another."

[2] Sugo, col. 5, lines 29-32, and Fig. 2.

Sugo also describes that a mosaic ion exchanger in which cation- and anion-exchange groups are arranged alternately may be produced using electron beams.[3] As shown in Sugo's Fig. 4, each area of the anion exchange groups and each area of the cation exchange groups are arranged such that they are not in contact with each other.

Thus, Sugo does not disclose or suggest at least the claimed:

> wherein, in a deionization compartment, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are ***alternately laminated*** on one another ***in a direction*** intersecting a water-passing direction ***from a water inlet to a treated water outlet of the deionization compartments*** such that ***opposite ends of each of the sheets of the anion exchange fibrous material and the sheets of the cation exchange fibrous material*** come into contact with both of an anion exchange membrane and a cation exchange membrane demarcating the deionization compartment.

By arranging the surface of the laminated structure of the cation- and anion-exchange fibrous materials to intersect the water-passing direction, the contact sites between the adjacent surfaces of the adjacent sheets of the cation exchange fibrous materials and the anion exchange fibrous materials of the laminated structure and the water are uniformly formed throughout the surfaces of the laminated structure. Near the contact sites, H_2O molecules are exposed to the sharp electrical potential gradient filed generated in close proximity to both of the anion exchange groups on the sheet of the anion exchange fibrous materials and the cation exchange groups on the sheet of the cation exchange fibrous materials, wherein H_2O is effectively dissociated into OH^- and H^+ ions.[4]

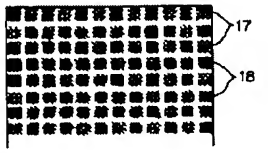
Sugo uses a mosaic ion exchanger that includes a plurality of regions of cation- and anion-exchange groups in one sheet. Between the region of cation exchange groups and the region of anion exchange groups, there are inactive areas. Thus, in Sugo's structure, the

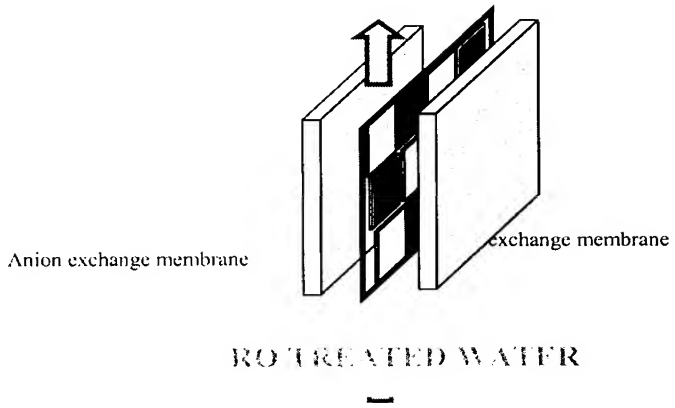
[3] Sugo, col. 6, lines 22-25, and Fig. 4.
[4] Specification, page 23, line 15 to page 24, line 9.

contact sites between the anion- and cation-exchange groups are not formed uniformly throughout the surface of the sheet.

Sugo's Fig. 4

【図４】





Above is a schematic drawing of the structure disclosed in Sugo. The ion exchange material does not form laminated sheets. In Sugo's structure, only one sheet is disposed between an anion exchange membrane and a cation exchange membrane, and the sheet is arranged to form a mosaic of anion and cation exchange regions. In this arrangement, there are many small regions of cation exchanger and anion exchanger, and such an arrangement is like a mixed bed of ion exchange beads which is conventionally used. In Sugo's structure, an inactive area is formed between the cation exchangers and the anion exchangers. Therefore, not all feed water, which passes through the demineralizing compartment, contacts with the anion exchanger and the cation exchanger alternately.

Further, in the inactive area, since the anion exchanger and cation exchanger do not contact with each other, an electric field occurred therein is weak. A weak electrolyte does not dissociate in such a weak electric field.

Akahori describes that sheets of ion-exchange membranes, ion-exchange non-woven fabrics, and ion-conducting spacer are placed one on another to form a composite sheet member that comprises a cell consisting of a deionization compartment held between to concentration compartments. The composite sheet member is then wound onto an electrode

into a cylindrical form, which is surrounded with the other electrode to fabricate a deionization unit.[5]

Akahori does not disclose or suggest a structure in which the anion- and cation-exchange fibrous materials form a laminated structure.

Moreover, Sugo and Akahori, taken in proper combination, do not disclose or suggest the invention defined by Claim 15. Even if the mosaic ion exchanger of Sugo is used as the ion exchange non-woven fabric of Akahori, the resulting structure is completely different from the structure of Claim 15. The combined disclosures of Sugo and Akahori do not disclose or suggest at least the claimed "in the deionization compartments, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are alternately laminated on one another."

In view of the above-noted distinctions, Applicants respectfully submit that Claim 15 (and any claims dependent thereon) patentably distinguish over Sugo and Akahori, taken alone or in proper combination.

Claim 18 recites, *inter alia*,

> wherein, in a deionization compartment, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are ***alternately laminated*** on one another ***in a direction*** intersecting a water-passing direction ***from a water inlet to a treated water outlet of the deionization compartment*** such that ***opposite ends of each of the sheets of the anion exchange fibrous materials and the sheets of the cation exchange fibrous material*** come into contact with both of the sheet-shaped anion exchange fibrous material and the sheet-shaped cation exchange fibrous material.

Claim 18 patentably distinguishes over Sugo and Akahori, taken alone or in proper combination, for at least the reasons stated for Claim 15.

Claim 25 recites, *inter alia*,

[5] Akahori, col. 12, lines 61 to col. 13, line 3.

wherein, in the deionization compartment, one or more sheets of anion exchange fibrous materials and one or more sheets of cation exchange fibrous materials are ***alternately laminated*** on one another ***in a direction*** intersecting a water-passing direction ***from a water inlet to a treated water outlet of the deionization compartment*** such that ***opposite ends of each of the sheets of the anion exchange fibrous material and the sheets of the cation exchange fibrous material*** come into contact with both of an anion exchange membrane and a cation exchange membrane demarcating the deionization compartment, and wherein at least one of the sheets of anion exchange fibrous material and the sheets of cation exchange fibrous material is a material obtained by introducing an ion exchange group onto a substrate using radiation-induced graft polymerization.

Claim 25 (and any claims dependent thereon) patentably distinguishes over Sugo and Akahori, taken alone or in proper combination, for at least the reasons stated for Claim 15.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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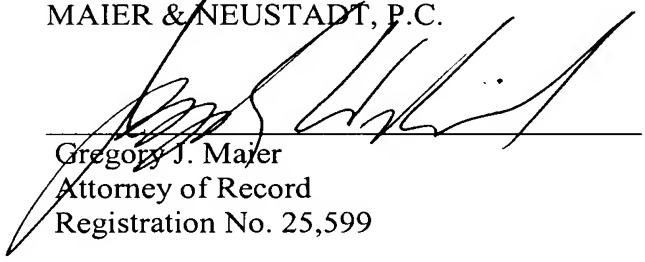

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